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merge polygons surface normal

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Products - Solid Modeling Solutions

So at the right, a splitting **surface** has been added and the **Merge** operator ...
 a connected set of **polygons** with 3D points, UV points and **surface normals**. ...
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SMLib Tutorial

User Call Backs with 3D points and **surface normals**. ... Polygonal Boolean;
Polygon Decimation; Ray Firing. The Boolean/**Merge** functionality is one of the ...
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PolygonModeling - Wikibooks

Each triangle or **polygon** in animation software has a "**normal**" If a triangle ...
 A element is a distinct **surface**. If two **polygons** are created side by side, ...
en.wikibooks.org/wiki/PolygonModeling - 18k - [Cached](#) - [Similar pages](#)

Commands: Modeler

MERGEPOINTS [nmindist]: **Merge** points lying within a certain minimum distance ...
Polygons. FLIP: Flip the sidedness (reverse the **surface normals**) of faces ...
www.newtek.com/products/lightwave/developer/LW80/8lwsdk/docs/commands/modeler.html - 29k -
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VolumeObjects Page 3

The two best examples of these primitives would be **polygons** or NURBS ... Based on
 the angle of intersection between the **surface normal** and the camera ...
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[PPT] Modeling

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Polygon Mesh. Creating, converting, **merging**, cutting, editing. 5/31/05 ...
 All elements in 3D space (**polygons**, curves, and **surfaces**) are made of points, ...
www.comp.nus.edu.sg/~cs3246/CS3246_01/model1.ppt - [Similar pages](#)

Meshing with Rhino

As you move the cursor across the object, the **normal** to the **surface** at that ...
 The weld command will attempt to **merge** the vertices of adjacent **polygons** ...
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3D Theory - Mesh - Martin Baker

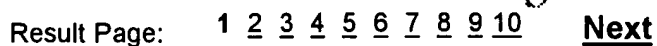
To do this here is a diagram looking along the plane of the **surface**: ...
 As described here the **normal** to the **polygon** can be calculated from the cross ...
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 Phong shading model, linear interpolants of **surface normals** with a ... Lower left:
 view of a single square **polygon** with **normals** ...
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1 Introduction to Polygonal Modeling

caad.arch.ethz.ch/info/maya/manual/ UserGuide/ModelingPoly/PolyIntro.fm.html - 39k - Cached - Similar pages



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File Format: PDF/Adobe Acrobat - [View as HTML](#)Click the eye icon and turn **Normals** on. **Normals** are represented by short blue... create a low-**poly**gon panel to assist with the blend and **merge** operations. ...

www.softimage.com/education/xsi/SelfPacedLearning/ Tutorials/webTutorials/XSI_3_0/Boombox/XSI30_Tutorial03.pdf -

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Level Of Detail (LOD)

... Normal Simplification: **merge** adjacent faces with near **parallel normals**.**Polygon** simplification algorithms generally fall into one of three categories. ...www.cs.nps.navy.mil/people/faculty/ capps/4473/projects/LOD/LODlong.html - 20k - [Cached](#) - [Similar pages](#)

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File Format: Microsoft Powerpoint 97 - [View as HTML](#)Imagine this is my screen and the **polygons** that will occupy my screen ...Silhouette created with larger version of donut with **normals** inverted and material ...www.evl.uic.edu/spiff/class/cs426/Notes/hardware.ppt - [Similar pages](#)

Modeling Polygons & Polygon Meshes

Invert **polygons** to change the direction of their **normals**. Combine **poly**gon meshesby blending or **merging**. Perform Boolean operations to obtain the difference ...www.iro.umontreal.ca/~roys/ softimage/html/model/polys.html - 160k - [Cached](#) - [Similar pages](#)

Commands: Modeler

A smooth subdivide creates **polygons** with **normals** that interpolate the ...The perpendicular and **parallel** values determine the number of segments that will ...

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Dave's Phenomenal Maya Cheat Sheet – Animation Menu Set

Select a face or faces of a **poly**gon. Then select the Extrude tool. ... Sometimes inmodifying an object **normals** can get switched. To deal with this you can: ...www.gatewaycoalition.org/files/ introlabs/ed/documentation/polygon.html - 36k - [Cached](#) - [Similar pages](#)

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lotsofpixels - spinPoly

Because spinPoly only modifies **polygons**, not vertices, then any weight maps you... Repairing 'bad **normals**' on quads. Sometimes, especially with quads which ...www.lotsofpixels.com/spinPoly2/ - 9k - [Cached](#) - [Similar pages](#)

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of **parallel** methods for faster isosurface generation on SIMD machines. A sequential version of a ... ture (retransversal of **merged polygons**). Also, very ...
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models space, the real goal of detecting **coplanar faces** is to find ... **normal vector** of the face and the **normal vector** of every ...

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... where A_i , B_i , C_i is the **normal vector** of its plane and ... It is worth mentioning, that **coplanar faces** may have normal vectors pointing in opposite directions ...

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for two adjacent **coplanar faces** exactly cancel each other. For non- ... residual vector (the **normal vector** of a new plane) remains that pe- ...

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Simplification Algorithms

... produces too fine triangulated polygon meshes with many **coplanar faces**. ... by a displacement along the **normal vector** by ϵ and the inner ...

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normal vector at an M vertex (meaning the average of the normals to the six ... connecting them is their common axis, a flange between two **coplanar faces** f ... torus.math.uiuc.edu/jms/Papers/cub-poly/polys.pdf - [Similar pages](#)

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objects because the **normal vector** of each polygon is set to point ... (1), put the face S_k and its **coplanar faces** in O_k into the next ...

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normal vector indicates the plane's orientation, while a point on the plane (or a 'distance from ... For pair3 of non-**coplanar faces**, contour3 ...

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In progress: ----- *I'm aware that the inversion vertex ...

... and computes only one **normal vector** per face, but skew subdivisions can ... corrected in meshedges(): skew **coplanar faces** had common edges marked as ...

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Koders - csg.cpp

... by poly->index, // the "dominant" part of the polygon's **normal vector**. ... philippe@strojka.

cs.kuleuven.ac.be> // // non-coplanar faces containing contours that ...

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




limited since the deviation of the normal vector of each triangle. must be
non-negative. ... of two coplanar faces touch, then there is always a touch of an ...

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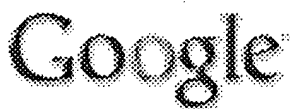
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NLib Routines

... G_makpln Make plane object from point and **normal vector**; G_makppl Make polgon

... U_isp1li Is 1-D point set colinear; U_isp1pl Is 1-D point set **coplanar** ...

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or **coplanar**. This line will intersect a third plane in one point if ... direction of the plane **normal vector** determines whether the ...

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coplanar object surfaces and some points may be even part of ... circle centre and each point with a **normal vector** is mapped ...

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a vertex whose surrounding faces are relatively **coplanar**. and re-triangulates the created hole ... change of the **normal vector** field U on a surface S in di- ...

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algorithm based on the estimated **normal vector** and. planarity measure at every data point and ... sets in each **coplanar** triangle set first, and then extract ...

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Coplanar facets merging. **Coplanar** or nearly **coplanar** facets are searched for in the ... error cost to **merge** u into v at each step is defined as follows: ...

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coplanar strokes are identified and used as the basis for shad- ... tial **normal vector** is given by the normalized cross product. of the two strokes. ...

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An Octree Surface Codification Based On Discretized Planes .

The ability to **merge** co-planar elements of this method achieves a high ...

On a bottom-up traversal of this octree, **coplanar** polygons are detected and ...

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In case of collision, the point $P(t)$ will be **coplanar** with the plane defined ...
If plane is XY then the plane equation is $Z=0$ thus its **normal vector** of the ...
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merge algorithms, the centroid is a single vertex and associated faces. ...
a vertex whose surrounding faces are relatively **coplanar** ...
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Systems in Motion (SIM) - Technical overview

Merge datasets; Query dataset for elevation and **surface normals** along a route;

View individual datasets; Write changes to database files ...

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CEI - visualization and post-processing for CFD flow feature detection

When **surface** traces **merge**, the flow typically separates along the **merge** line.

... The algorithm includes the **surface normal** vector of each **surface** polygon ...

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Blobs Sample (DirectX 9.0 C++)

... create smooth **surfaces** from a series of enclosed volumes (called blobs) which

merge together; ... Figure 2: **Surface normal** buffer Figure 3: Color buffer ...

msdn.microsoft.com/library/en-us/directx9_c/ directx/graphics/TutorialsAndSamples/Samples/Blobs.asp - 20k -

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od[forum] > How can I connect this pop network?

If you connect geometry with the **Normal** attribute into a **Merge** SOP, other connected

... The **surface normals** are fine, which is why it renders properly. ...

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Rhinoceros 3.0 Bonus Tools

OffsetNormal - Offsets a curve on a **surface normal** to the **surface**, ... MergeAllFaces -

Merge all co-planar faces of a polysurface into one face. ...

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Paper: Triangle Mesh-Based Edge Detection and Its Application to ...

Merge regions whose watershed depth is below a preset threshold and relabel the

regions. Mangan s algorithm has two ... Utah **surface surfaces** ucla **normals** ...

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Any **surface** whose **normal** is greater than 60° away from the sensor's line of sight

will not ... **Merge** the polylines of the local model into the global model. ...

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Robotics Institute: Spatial Frequency

In order to segment the textures, we **merge** image regions with similar texture.

... We solve this problem by using the local **surface normal** estimates to undo ...

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PTC - Ask the PLM: ISDX Technical Tips

How do I connect a **surface normal** to a plane (sometimes called 'centerline ...

Before you connect the **surface normal** to the plane, you want to make sure the ...

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[PDF] Directional Heat LoadsFile Format: PDF/Adobe Acrobat - [View as HTML](#)with the **surface normal**. It has a heat flux passing through it in the ...When asked if it is OK to specify additional range of nodes to **merge**,. respond No. ...www.mscsoftware.com/support/online_ex/n4w/N4w104/Exer_05_Directional_Heat.pdf - [Similar pages](#)

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Face Match Editing

 ... Use this command to **merge faces** with common boundaries into one continuous face. ...

 None - The **surface normal** direction along boundary edges are not fitted. ...

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 ... the difference occuring during the passes to **merge faces**. ... Could the **surface normal** information be stored in the current .bsp file for use in light? ...

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 ... m4x4_t)); // transform to axial projection // axis depends on **surface normal** //

 NOTE: could ... i]->d_texture, movefaces[i]); } /now try to **merge faces** with their ...

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 ... One typical approach to mesh simplification is to **merge faces** based on some ... reconstruction techniques, the role of the **surface normal** at a point is critical. ...

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 IP "VB\flP VlfacethreshVP" **Merge faces** sharing an edge where the faces are nearly coplanar: when ... 'N' Each vertex includes a **surface normal** vector. ...

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... the radius as the **square** of the length of the **vector** from the left **adjacent**

... the center point to the right **adjacent** point (BC) onto the **normal vector** ...

www.cc.gatech.edu/~william/P1/phased.html - 10k - [Cached](#) - [Similar pages](#)

3D Computer Graphics Tutorials

As the viewpoint is translated, the locus moves into other **adjacent** quadrants

... to have the **normal vectors** of a nearby 3D object for collision detection. ...

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surface **normals** of all four **adjacent squares** and averaging them. However it works.

quite well to compute only one **normal**, for one of the incident **squares**, ...

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Spacesimulator.net - vectors, normals and OpenGL lighting

FUNDAMENTAL NOTIONS ON STRAIGHT LINES, **VECTORS** and **NORMALS** ... $OP = \text{Square root of } (Ay \cdot Ay + OQ \cdot OQ)$ Now Ay is known, to calculate OQ we have to apply ...

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[PDF] The geometry of least squares We can think of a vector as a point ...

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A **vector** of length one is called a **normal vector**. Any non-zero **vector** can be ...

Now consider the best **squares** fit from this geometric perspective ...

stat-www.berkeley.edu/users/nolan/stat135/HO/geometry.pdf - [Similar pages](#)

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Selecting None will disable the display of all **normal vectors**. Selecting Vertex or Facet will display the corresponding **normal vectors** in the current 3D ...

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CAP4021 Lecture 6

Compute the surface **normal vector** for this triangle via the cross product ...

Now construct the surface **normals** to two of the **adjacent** faces that are not ...

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principal **normal vector**, and b is called the unit binormal **vector**. ... angle between

the osculating planes at two points **adjacent** to each other, say $P(s)$...

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segments with segments of **adjacent** scan lines based on some similarity criterion.

... circle centre and each point with a **normal vector** is mapped ...

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The slope and aspect define a **vector normal** to the earth's surface, ... and the selected region size will be a **square**. **Adjacent** points will have similar but ...
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Blinn-**phong shading**. color = attenuation*(max(0,dot(N,L))*diffuse + pow(max(0,dot(N,H)),shi)*gloss)*lightColor. L = normalized light vector in tangent space ...
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Phong shading is more advanced than flat and Gouraud shading, ... **Phong shading** is so computationally intensive that it is not feasible to use in real-time ...
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The Snake **algorithm** is fast and relatively insensitive to background texture ...

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This is an $O(n^3)$ **algorithm** . partial **lattice** - similar to method 2, except that it

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Combining CSPs into a MUSE CSP. Problems which have an inherent **lattice** structure or

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and has associ- ... core (ie, unique identifier), the **combining edge**. ...

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3 Volumetric integration

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Algorithms have been developed and tested to rebuild the **surface** of ... It may

therefore be possible to develop a hierarchic design **algorithm** in which the ...

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... the **surface** we will use the **algorithm** introduced by Metropolis et al[37]. ...

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¹ Model-based object recognition in dense-range images—a review

Farshid Arman, J. K. Aggarwal

March 1993 **ACM Computing Surveys (CSUR)**, Volume 25 Issue 1

Full text available:  pdf(3.42 MB)

Additional Information: [full citation](#), [abstract](#), [references](#), [citings](#), [index terms](#), [review](#)

The goal in computer vision systems is to analyze data collected from the environment and derive an interpretation to complete a specified task. Vision system tasks may be divided into data acquisition, low-level processing, representation, model construction, and matching subtasks. This paper presents a comprehensive survey of model-based vision systems using dense-range images. A comprehensive survey of the recent publications in each subtask pertaining to dense-range image object recogni ...

Keywords: 3D object recognition, 3D representations, CAD-based vision, dense-range images, image understanding

2 Hierarchical face clustering on polygonal surfaces

Michael Garland, Andrew Willmott, Paul S. Heckbert

March 2001 **Proceedings of the 2001 symposium on Interactive 3D graphics**

Full text available: pdf(1.77 MB)

Additional Information: full citation, references, citings, index terms

Keywords: dual contraction, face clusters, quadric error metrics, spatial data structures, surface simplification

3 Object shape and reflectance modeling from observation

Yoichi Sato, Mark D. Wheeler, Katsushi Ikeuchi

August 1997 **Proceedings of the 24th annual conference on Computer graphics and interactive techniques**


Full text available: pdf(1.11 MB)

Additional Information: full citation, references, citings, index terms

4 The digital Michelangelo project: 3D scanning of large statues

Marc Levoy, Kari Pulli, Brian Curless, Szymon Rusinkiewicz, David Koller, Lucas Pereira, Matt Ginzton, Sean Anderson, James Davis, Jeremy Ginsberg, Jonathan Shade, Duane Fulk

July 2000 **Proceedings of the 27th annual conference on Computer graphics and interactive techniques**

Full text available:  [pdf\(10.83 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We describe a hardware and software system for digitizing the shape and color of large fragile objects under non-laboratory conditions. Our system employs laser triangulation rangefinders, laser time-of-flight rangefinders, digital still cameras, and a suite of software for acquiring, aligning, merging, and viewing scanned data. As a demonstration of this system, we digitized 10 statues by Michelangelo, including the well-known figure of David, two building interiors, and all 1,163 extant f ...

Keywords: 3D scanning, cultural heritage, graphics systems, mesh generation, range images, rangefinding, reflectance and shading models, sensor fusion

5 GAPS: general and automatic polygonal simplification

Carl Erikson, Dinesh Manocha

April 1999 **Proceedings of the 1999 symposium on Interactive 3D graphics**


Full text available:  [pdf\(1.29 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: levels-of-detail, multi-resolution modelling, polygonal simplification, surface attributes, topological simplification, walkthroughs

6 Real-time 3D model acquisition

Szymon Rusinkiewicz, Olaf Hall-Holt, Marc Levoy

July 2002 **ACM Transactions on Graphics (TOG) , Proceedings of the 29th annual conference on Computer graphics and interactive techniques**, Volume 21 Issue 3

Full text available:  [pdf\(3.45 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

The digitization of the 3D shape of real objects is a rapidly expanding field, with applications in entertainment, design, and archaeology. We propose a new 3D model acquisition system that permits the user to rotate an object by hand and see a continuously-updated model as the object is scanned. This tight feedback loop allows the user to find and fill holes in the model in real time, and determine when the object has been completely covered. Our system is based on a 60 Hz. structured-light ran ...

Keywords: 3D model acquisition, 3D scanning, range, real-time modeling, scanning

7 Reverse Engineering: Range-Image segmentation and model reconstruction based on a fit-and-merge strategy

M. Djebali, M. Melkemi, N. Sapidis

June 2002 **Proceedings of the seventh ACM symposium on Solid modeling and applications**

Full text available:  [pdf\(381.59 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)


A segmentation and model-reconstruction algorithm is proposed based on polynomial approximation and on a novel version of "region growing". First, an initial partition is calculated on the basis of differential-geometric properties of the range image. Then, the first merging procedure is applied ("merge with constraints") aiming at correctly identifying principal surfaces of the model. It examines all possible mergers of regions and selects those satisfying strict compatibility constraints. The ...

Keywords: 3D reconstruction, range data, reverse engineering, segmentation

8 Spectral processing of point-sampled geometry

Mark Pauly, Markus Gross

August 2001 **Proceedings of the 28th annual conference on Computer graphics and interactive techniques**

Full text available:  [pdf\(3.06 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)


We present a new framework for processing point-sampled objects using spectral methods. By establishing a concept of local frequencies on geometry, we introduce a versatile spectral representation that provides a rich repository of signal processing algorithms. Based on an adaptive tessellation of the model surface into regularly resampled displacement fields, our method computes a set of windowed Fourier transforms creating a spectral decomposition of the model. Direct analysis and manipulat...

Keywords: Fourier transform, point-based representations, signal processing, spectral filtering, subsampling

9 Interactive texture mapping

Jérôme Maillot, Hussein Yahia, Anne Verroust

September 1993 **Proceedings of the 20th annual conference on Computer graphics and interactive techniques**



Full text available:  [pdf\(407.26 KB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: interaction, realistic rendering, texture map distortion, texture mapping

10 Dynamic view-dependent simplification for polygonal models

Julie C. Xia, Amitabh Varshney


October 1996 **Proceedings of the 7th conference on Visualization '96**

Full text available:  [pdf\(2.16 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)
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11 Three-dimensional object recognition

Paul J. Besl, Ramesh C. Jain

March 1985 **ACM Computing Surveys (CSUR)**, Volume 17 Issue 1

Full text available:  [pdf\(7.76 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

A general-purpose computer vision system must be capable of recognizing three-dimensional (3-D) objects. This paper proposes a precise definition of the 3-D object recognition problem, discusses basic concepts associated with this problem, and reviews the relevant literature. Because range images (or depth maps) are often used as sensor input instead of intensity images, techniques for obtaining, processing, and characterizing range data are also surveyed.

12 Session 4: big stuff: Out-of-core construction and visualization of multiresolution surfaces

Peter Lindstrom

April 2003 **Proceedings of the 2003 symposium on Interactive 3D graphics**

Full text available:  [pdf\(5.13 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We present a method for end-to-end out-of-core simplification and view-dependent visualization of large surfaces. The method consists of three phases: (1) memory insensitive simplification; (2) memory insensitive construction of a multiresolution hierarchy; and (3) run-time, output-sensitive, view-dependent rendering and navigation of the mesh. The first two off-line phases are performed entirely on disk, and use only a small, constant amount of memory, whereas the run-time system pages in only ...

Keywords: large-data visualization, out-of-core algorithms, surface simplification, view-dependent refinement

13 A survey of methods for recovering quadrics in triangle meshes

Sylvain Petitjean

June 2002 **ACM Computing Surveys (CSUR)**, Volume 34 Issue 2

Full text available:  [pdf\(3.91 MB\)](#)

Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

In a variety of practical situations such as reverse engineering of boundary representation from depth maps of scanned objects, range data analysis, model-based recognition and algebraic surface design, there is a need to recover the shape of visible surfaces of a dense 3D point set. In particular, it is desirable to identify and fit simple surfaces of known type wherever these are in reasonable agreement with the data. We are interested in the class of quadric surfaces, that is, algebraic surfa ...

Keywords: Data fitting, geometry enhancement, local geometry estimation, mesh fairing, shape recovery

14 A method for generating volumetric features from surface features

Xin Dong, Michael Wozny

May 1991 **Proceedings of the first ACM symposium on Solid modeling foundations and CAD/CAM applications**

Full text available:  [pdf\(815.72 KB\)](#)

Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

15 Photo & video texture: Textureshop: texture synthesis as a photograph editing tool

Hui Fang, John C. Hart

August 2004 **ACM Transactions on Graphics (TOG)**, Volume 23 Issue 3



Full text available:  pdf(584.96 KB) Additional Information: [full citation](#), [abstract](#), [references](#)
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We combine existing techniques for shape-from-shading and texture synthesis to create a new tool for texturing objects in photographs. Our approach clusters pixels with similar recovered normals into patches on which texture is synthesized. Distorting the texture based on the recovered normals creates the illusion that the texture adheres to the undulations of the photographed surface. Inconsistencies in the recovered surface are disguised by the graphcut blending of the individually textured pa ...

16 Fixing models: Interpolating and approximating implicit surfaces from polygon soup

Chen Shen, James F. O'Brien, Jonathan R. Shewchuk

August 2004 **ACM Transactions on Graphics (TOG)**, Volume 23 Issue 3

Full text available:  pdf(691.64 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)
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This paper describes a method for building interpolating or approximating implicit surfaces from polygonal data. The user can choose to generate a surface that exactly interpolates the polygons, or a surface that approximates the input by smoothing away features smaller than some user-specified size. The implicit functions are represented using a moving least-squares formulation with constraints integrated over the polygons. The paper also presents an improved method for enforcing normal constra ...

Keywords: Implicit surfaces, physically based animation, point-based surfaces, polygon soup, simulation envelopes, surface reconstruction, surface representation, surface smoothing, topological simplification

17 Real-time rendering of deformable parametric free-form surfaces

Frederick W. B. Li, Rynson W. H. Lau

December 1999 **Proceedings of the ACM symposium on Virtual reality software and technology**

Full text available:  pdf(1.23 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

Deformable objects are required to improve the realism of virtual reality applications. They are particularly useful in modeling clothes, facial expression, human and animal characters. A common method to render these objects is by tessellation. However, the tessellation process is computationally very expensive. If the object deforms, we need to retessellate the surface every frame, as its shape changes from one frame to the next. This computational burden poses a significant challenge to ...

18 Merging visibility maps

Mark H. Overmars, Micha Sharir


May 1990 **Proceedings of the sixth annual symposium on Computational geometry**

Full text available:  pdf(853.91 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Let V be a set of objects in space for which we want to determine the portions visible from a particular point of view u_{gr} . Assume V is subdivided in subsets V_1, \dots, V_z and the visibility maps $\&M_{gr;1}, \dots, \&M_{gr;z}$ of these subsets from point u_{gr} are known. We show that the visibility map $\&$...

19 Data clustering: a review

A. K. Jain, M. N. Murty, P. J. Flynn

September 1999 **ACM Computing Surveys (CSUR)**, Volume 31 Issue 3Full text available:  pdf(636.24 KB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

Clustering is the unsupervised classification of patterns (observations, data items, or feature vectors) into groups (clusters). The clustering problem has been addressed in many contexts and by researchers in many disciplines; this reflects its broad appeal and usefulness as one of the steps in exploratory data analysis. However, clustering is a difficult problem combinatorially, and differences in assumptions and contexts in different communities has made the transfer of useful generic co ...

Keywords: cluster analysis, clustering applications, exploratory data analysis, incremental clustering, similarity indices, unsupervised learning

20 Statistical geometry representation for efficient transmission and rendering

Aravind Kalaiah, Amitabh Varshney

April 2005 **ACM Transactions on Graphics (TOG)**, Volume 24 Issue 2Full text available:  pdf(16.46 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Traditional geometry representations have focused on representing the details of the geometry in a deterministic fashion. In this article we propose a statistical representation of the geometry that leverages local coherence for very large datasets. We show how the statistical analysis of a densely sampled point model can be used to improve the geometry bandwidth bottleneck, both on the system bus and over the network as well as for randomized rendering, without sacrificing visual realism. Our s ...

Keywords: Point-based rendering, network graphics, principal component analysis, programmable GPU, progressive transmission, quasi-random numbers, view-dependent rendering

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Ioana Boier-Martin, Holly Rushmeier, Jingyi Jin

July 2004 **Proceedings of the 2004 Eurographics/ACM SIGGRAPH symposium on Geometry processing**Full text available: [pdf\(682.94 KB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

We present a method for parameterizing irregularly triangulated input models over polyhedral domains with quadrilateral faces. A combination of center-based clustering techniques is used to generate a partition of the model into regions suitable for remeshing. Several issues are addressed: the size and shape of the regions, their positioning with respect to features of the input geometry, and the amount of distortion introduced by approximating each region with a coarse polygon. Region boundaries ...

2 [Session P4: simplification: A memory insensitive technique for large model simplification](#)

Peter Lindstrom, Cláudio T. Silva

October 2001 **Proceedings of the conference on Visualization '01**
 Full text available: [pdf\(1.30 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)
[Publisher Site](#)

In this paper we propose three simple, but significant improvements to the OoCS (Out-of-Core Simplification) algorithm of Lindstrom [20] which increase the quality of approximations and extend the applicability of the algorithm to an even larger class of compute systems. The original OoCS algorithm has memory complexity that depends on the size of the output mesh, but no dependency on the size of the input mesh. That is, it can be used to simplify meshes of arbitrarily large size, but the complex ...

Keywords: external sorting, large data, out-of-core algorithms, polygonal surface simplification, quadric error metrics

3 [Session 1: Domain decomposition for multiresolution analysis](#)

Ioana M. Boier-Martin

June 2003 **Proceedings of the 2003 Eurographics/ACM SIGGRAPH symposium on Geometry processing**

Full text available:  [pdf\(4.24 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#)

This paper describes a method for converting an arbitrary mesh with irregular connectivity to a semi-regular multiresolution representation. A shape image encoding geometric and differential properties of the input model is computed. Standard image processing operations lead to an initial decomposition of the model that conforms to its salient features. A triangulation step performed on the resulting partition in image space, followed by resampling and multiresolution analysis in object space, c ...

Keywords: geometry images, model segmentation, multiresolution, subdivision surfaces

4 Hierarchical face clustering on polygonal surfaces

Michael Garland, Andrew Willmott, Paul S. Heckbert

March 2001 **Proceedings of the 2001 symposium on Interactive 3D graphics**

Full text available:  [pdf\(1.77 MB\)](#) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

Keywords: dual contraction, face clusters, quadric error metrics, spatial data structures, surface simplification

5 Clustered principal components for precomputed radiance transfer

Peter-Pike Sloan, Jesse Hall, John Hart, John Snyder

July 2003 **ACM Transactions on Graphics (TOG)**, Volume 22 Issue 3

Full text available:  [pdf\(9.29 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#)


We compress storage and accelerate performance of precomputed radiance transfer (PRT), which captures the way an object shadows, scatters, and reflects light. PRT records over many surface points a transfer matrix. At run-time, this matrix transforms a vector of spherical harmonic coefficients representing distant, low-frequency source lighting into exiting radiance. Per-point transfer matrices form a high-dimensional surface signal that we compress using *clustered principal component analysis* ...

Keywords: graphics hardware, illumination, monte carlo techniques, rendering, shadow algorithms

6 Back-face computation of polygon clusters

Subodh Kumar, Dinesh Manocha, William Garrett, Ming Lin



August 1997 **Proceedings of the thirteenth annual symposium on Computational geometry**

Full text available:  [pdf\(603.22 KB\)](#) Additional Information: [full citation](#), [references](#), [index terms](#)

7 Session P11: subdivision: Normal bounds for subdivision-surface interference detection

Eitan Grinspun, Peter Schröder

October 2001 **Proceedings of the conference on Visualization '01**

Full text available:  [pdf\(7.55 MB\)](#) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)
 [Publisher Site](#)

Subdivision surfaces are an attractive representation when modeling arbitrary topology free-form surfaces and show great promise for applications in engineering design [5, 6] and computer animation [10]. Interference detection is a critical tool in many of these applications. In this paper we derive normal bounds for subdivision surfaces and use these to develop an efficient algorithm for (self-) interference detection.

Keywords: gauss map, loop's scheme, multiresolution surfaces, self-interference, subdivision surfaces

8 Fast backface culling using normal masks

Hansong Zhang, Kenneth E. Hoff

April 1997 **Proceedings of the 1997 symposium on Interactive 3D graphics**

Full text available:  pdf(583.15 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

9 A continuous clustering method for vector fields

H. Garcke, T. Preußner, M. Rumpf, A. Telea, U. Weikard, J. van Wijk

October 2000 **Proceedings of the conference on Visualization '00**

Full text available:  pdf(1.64 MB) Additional Information: [full citation](#), [citations](#), [index terms](#)

10 A Characterization of Ten Hidden-Surface Algorithms

Evan E. Sutherland, Robert F. Sproull, Robert A. Schumacker


January 1974 **ACM Computing Surveys (CSUR)**, Volume 6 Issue 1

Full text available:  pdf(4.47 MB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

11 Silhouette clipping

Pedro V. Sander, Xianfeng Gu, Steven J. Gortler, Hugues Hoppe, John Snyder

July 2000 **Proceedings of the 27th annual conference on Computer graphics and interactive techniques**

Full text available:  pdf(6.31 MB) Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)



Approximating detailed with coarse, texture-mapped meshes results in polygonal silhouettes. To eliminate this artifact, we introduce silhouette clipping, a framework for efficiently clipping the rendering of coarse geometry to the exact silhouette of the original model. The coarse mesh is obtained using progressive hulls, a novel representation with the nesting property required for proper clipping. We describe an improved technique for constructing texture and normal maps over this coarse ...

Keywords: level of detail algorithms, rendering algorithms, texture mapping, triangle decimation

12 Mesh parameterization: Painting detail

Nathan A. Carr, John C. Hart

August 2004 **ACM Transactions on Graphics (TOG)**, Volume 23 Issue 3

Full text available:  pdf(25.68 MB)
 mov(25:32 MIN) Additional Information: [full citation](#), [abstract](#), [references](#)

Surface painting is a technique that allows a user to paint a texture directly onto a surface, usually with a texture atlas: a 1:1 mapping between the surface and its texture image. Many good automatic texture atlas generation methods exist that evenly distribute texture samples across a surface based on its area and/or curvature, and some are even sensitive to the frequency spectrum of the input texture. However, during the surface painting process, the texture can change non-uniformly and unpr ...

Keywords: 3D painting, Mesh parametrization, face clustering, texture atlas

13 A system for measuring surface facet orientation from atomic force microscope data 

John Hagedorn, Holly Rushmeier, John Blendell, Mark Vaudin

October 1996 **Proceedings of the 7th conference on Visualization '96**

Full text available:  pdf(769.28 KB)



[Publisher Site](#)

Additional Information: [full citation](#), [references](#), [index terms](#)

14 Core Vector Machines: Fast SVM Training on Very Large Data Sets 

Ivor W. Tsang, James T. Kwok, Pak-Ming Cheung

April 2005 **The Journal of Machine Learning Research**, Volume 6

Full text available:  pdf(468.46 KB) Additional Information: [full citation](#), [abstract](#)

Standard SVM training has $O(m^3)$ time and $O(m^2)$ space complexities, where m is the training set size. It is thus computationally infeasible on very large data sets. By observing that practical SVM implementations only *approximate* the optimal solution by an iterative strategy, we scale up kernel methods by exploiting such "approximateness" in this paper. We first show that many kernel methods can be equivalently formulated as minimum ...

15 Fixing models: Variational shape approximation 

David Cohen-Steiner, Pierre Alliez, Mathieu Desbrun

August 2004 **ACM Transactions on Graphics (TOG)**, Volume 23 Issue 3

Full text available:  pdf(783.93 KB)



[mov\(33:47](#)

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Additional Information: [full citation](#), [abstract](#), [references](#)

A method for concise, faithful approximation of complex 3D datasets is key to reducing the computational cost of graphics applications. Despite numerous applications ranging from geometry compression to reverse engineering, efficiently capturing the geometry of a surface remains a tedious task. In this paper, we present both theoretical and practical contributions that result in a novel and versatile framework for geometric approximation of surfaces. We depart from the usual strategy by casting ...

Keywords: Lloyd's clustering algorithm, anisotropic remeshing, geometric approximation, geometric error metrics, surfaces

16 Clustering in large graphs and matrices 

P. Drineas, Alan Frieze, Ravi Kannan, Santosh Vempala, V. Vinay

January 1999 **Proceedings of the tenth annual ACM-SIAM symposium on Discrete algorithms**

Full text available:  pdf(927.53 KB) Additional Information: [full citation](#), [references](#), [citations](#), [index terms](#)

17 Model-based object recognition in dense-range images—a review

Farshid Arman, J. K. Aggarwal


March 1993 **ACM Computing Surveys (CSUR)**, Volume 25 Issue 1Full text available:  pdf(3.42 MB)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#), [review](#)

The goal in computer vision systems is to analyze data collected from the environment and derive an interpretation to complete a specified task. Vision system tasks may be divided into data acquisition, low-level processing, representation, model construction, and matching subtasks. This paper presents a comprehensive survey of model-based vision systems using dense-range images. A comprehensive survey of the recent publications in each subtask pertaining to dense-range image object recogni ...

Keywords: 3D object recognition, 3D representations, CAD-based vision, dense-range images, image understanding

18 Facial image retrieval, identification, and inference system

J. K. Wu, Y. H. Ang, P. C. Lam, S. K. Moorthy, A. D. Narasimhalu

September 1993 **Proceedings of the first ACM international conference on Multimedia**Full text available:  pdf(293.46 KB) ps(2.38 MB)Additional Information: [full citation](#), [references](#), [index terms](#)**19 Performance analysis of distributed applications using automatic classification of communication inefficiencies**

Jeffrey Vetter

May 2000 **Proceedings of the 14th international conference on Supercomputing**Full text available:  pdf(1.20 MB)Additional Information: [full citation](#), [abstract](#), [references](#), [citations](#), [index terms](#)

We present a technique for performance analysis that helps users understand the communication behavior of their message passing applications. Our method automatically classifies individual communication operations and it reveals the cause of communication inefficiencies in the application. This classification allows the developer to focus quickly on the culprits of truly inefficient behavior, rather than manually foraging through massive amounts of performance data. Specifically, we trace t ...

20 Session 7: Two algorithms for fast reclustering of dynamic meshed surfaces

Nathan A. Carr, John C. Hart

July 2004 **Proceedings of the 2004 Eurographics/ACM SIGGRAPH symposium on Geometry processing**Full text available:  pdf(737.78 KB)Additional Information: [full citation](#), [abstract](#), [references](#), [index terms](#)

Numerous mesh algorithms such as parametrization, radiosity, and collision detection require the decomposition of meshes into a series of clusters. In this paper we present two novel approaches for maintaining mesh clusterings on dynamically deforming meshes. The first approach maintains a complete face cluster tree hierarchy using a randomized data structure. The second algorithm maintains a mesh decomposition for a fixed set of clusters. With both algorithms we are able to maintain clusterings ...

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